38

2.3.6. Minimum Range

2.3.6.1. Purpose

The purpose of this test is to determine the minimum radar detection and tracking ranges and to determine the effect of this range upon ACM tactics and airborne tanking procedures.

2.3.6.2. General

The theoretical minimum radar range was discussed in the radar theory section. The theoretical minimum range is the absolute best the radar can achieve. Realistically, there are other factors that often cause this number to grow beyond the theoretical minimum. The display can play an important part, particularly in the case of a PPI display. As the detection video closes into the notch of the PPI display, videos can become unusable to the operator since all the noise is also compressed into this small area of the display. For a B scan format, the problem is relieved somewhat since the azimuth is spread out at the bottom of the display but display distortion can still be a factor.

Minimum tracking range is limited first by the minimum theoretical detection range and will not be less than this range. A number of other factors also come into play, including the quality of the tracker and its ability to handle the rapid changes in target azimuth that can occur at close ranges. The minimum detection range is almost always better than the minimum tracking range; however, for a non-maneuvering target, modern trackers are becoming good at close target tracking and the minimum detection and tracking ranges are usually close to each other. Since the tracking range is usually the limiting factor, time can be saved by checking this limit and if it is adequate, assuming the detection will also be adequate. Minimum detection and tracking ranges can be mission related to the requirement to close on a possible hostile target to gain a Visual Identification (VID) in poor visibility, the most restrictive minimum weapons release range (usually a gun limit), and the requirement to close on a tanker aircraft in poor visibility.

2.3.6.3. Instrumentation

Data cards are required for this test with an optional voice recorder.

2.3.6.4. Data Required

Record the radar derived range at which the radar loses tracking on the target and the range at which detection is no longer held on the target. During mission relatable ACM, intercepts and simulated or actual tanking, qualitatively evaluate the effects of the minimum detection and tracking ranges upon the utility of the radar.

2.3.6.5. Procedure

Position the target 1/2 nm ahead of the test airplane at the same heading and speed and 1,000 feet above the test airplane. Establish radar contact and an STT. Slowly close on the target. When visual contact is achieved, climb to the target's altitude and continue to close on the target until tracking is dropped or a minimum of 300 feet separation. The 300 feet "bubble" may be broken and the test airplane may close to a lesser range if both pilots and airplanes are formation qualified, and the pilot in the test airplane is not the operator concentrating on the radar. If weather is such that visual contact cannot be maintained, the test airplane should immediately descend to 1,000 feet below the target airplane. After completing the test in STT mode, establish the shortest range scale search mode and reduce airspeed slightly to open the range slowly until detection of the target is achieved. During mission relatable ACM, intercepts and simulated or actual tanking, note the effects of the limitations above upon mission tactics.

2.3.6.6. Data Analysis and Presentation

Use the radar derived ranges at broken STT lock and at initial search mode detection as the minimum tracking and detection ranges. Relate the minimum ranges to their effects upon Instrument Meteorological Conditions (IMC) intercepts for VID, the minimum range for the shortest range weapon system that the airplane can carry (will probably be guns), and to IMC tanking procedures.

2.3.6.7. Data Cards

A sample data card is provided as card 10.

CARD NUMBER ___   TIME ____   PRIORITY L/M/H

AIR-TO-AIR MINIMUM DETECTION AND TRACKING RANGE

[JOIN THE TARGET 1/2 NM IN TRAIL WITH THE TARGET AT THE SAME SPEED AND HEADING AND 1,000 FEET ABOVE. ESTABLISH STT AND SLOWLY CLOSE. CLIMB TO THE TARGET'S ALTITUDE WITH A VISUAL. CONTINUE TO CLOSE TO A BROKEN LOCK OR A ___ FEET MINIMUM. ESTABLISH A MINIMUM SCALE SEARCH MODE. OPEN UNTIL DETECTION.]

MODE	RANGE	LOST/GAIN	DEGRADATION

[EVALUATE THE EFFECTS OF THE MIN RANGES ON ACM, INTERCEPT AND TANKING TACTICS.]

MINIMUM WEAPONS RANGE_____

EFFECTS:

ACM EFFECTS:

TANKING EFFECTS:

Card 10: Air-to-Air Minimum Detection And Tracking Range Data Card